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EVOLUTION OF THE HEAVY METAL CONTENT (Pb, Cd, Cu, Zn) IN POLLUTED SOILS, UPON THE CESSATION OF THE POLLUTING ACTIVITY

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ABSTRACT

The cessation of the activity in the industrial town of Zlatna allows for the approach of a research activity focused on the monitoring of the heavy metal pollution degree of soils, as well as a pertinent analysis of soil evolution in this alternative. Pedologic and agrochemical research in the area is further more important as soils were affected in different degrees by heavy metal contamination (pollution) (Pb; Cd, Cu, Zn) and they did not benefit from any ecologic recovery method or measure.

The present paper aims at analyzing the degree of representation in total and mobile (soluble) forms of heavy metals (Pb, Cd, Cu, Zn), after 10-12 years from the cessation of the industrial activity.

INTRODUCTION

Heavy-metal polluted soils (Pb, Cd, Cu, Zn) in different areas of the country underwent previous research and characterization from the point of view of the representation of these elements in connection to the multitude of factors involved in their circuit and accumulation within ecosystem components (1), (2), (3), (4).

At present, once the polluting industrial activity has ceased, it is paramount to conduct monitoring research and activities for the evolution of these soils from under the influence of polluting and degrading factors towards the accomplishment and application of efficient measures for the ecologic rehabilitation of soils and rendering these areas productive once again.

The paper presents the level of representation for the heavy metal content (Pb, Cd, Cu, Zn), in total and soluble forms, for different stationary situations in the Zlatna area.

MATERIAL AND METHOD

Soil analyses were conducted in total forms (soluble in aqua regia- H_2SO_4+HNO_3) and mobile forms (soluble in D+PA) and underwent interpretations according to MAPPM order 756/1997. (table 1).

Table 1

Element	Reference values for elements mg/kg soil)		
	Normal values	Alert threshold	Intervention threshold
Pb	20	50	100
Cd	1	3	5
Cu	20	100	200
Zn	100	300	600

RESULTS AND DISCUSSIONS

The soil analyses conducted, as total and mobile (soluble) forms for the main heavy metals mentioned previously, exhibiting high and excessive contamination levels, also show high values, significantly above normal, and frequently over the alert and/or intervention threshold, 10-12 years after the cessation of the polluting activity (tables 2,3).

Table 2

Profiles	Sample n	Depth cm	Heavy metals, mg/kg.soil			
			Pb	Cd	Cu	Zn
1	1	0-10	502	4.03	536	668
	2	10-20	124	2.53	194	350
	3	20-40	25	0.56	30	76
2	4	0-10	359	0.30	201	119
	5	10-20	206	1.59	112	49
	6	20-40	32	0.29	63	28
3	7	0-10	517	2.52	265	328
	8	10-20	189	1.72	116	179
	9	20-40	64	0.85	37	102
4	10	0-10	198	0.99	105	111
	11	10-20	173	1.10	117	121
	12	20-40	23	0.64	28	61
5	13	0-10	539	2.78	420	545
	14	10-20	587	3.26	473	608
	15	20-40	69	0.81	73	240

Table 3

Heavy metal content (Pb, Cd, Cu, Zn) in polluted Zlatna soils (2012) (soluble forms)

Profiles	Sample n	Depth cm	Heavy metals, mg/kg.soil			
			Pb	Cd	Cu	Zn
1	1	0-10	153	1.58	172	102
	2	10-20	26	1.11	64	89
	3	20-40	3.6	0.10	3.6	3.2
2	4	0-10	218	0.66	60	3.4
	5	10-20	133	0.06	46	2.3
	6	20-40	9.4	0.05	36	3.2
3	7	0-10	376	1.02	108	53
	8	10-20	84	0.74	30	28
	9	20-40	22	0.28	7.9	28
4	10	0-10	124	0.36	44	22
	11	10-20	160	0.38	50	24
	12	20-40	6.4	0.14	4.5	8.7
5	13	0-10	145	1.33	126	82
	14	10-20	140	1.23	116	92
	15	20-40	14.1	0.41	14.2	20

The analysis of results obtained presents great differentiations between polluting elements.

Lead: it can be assessed as the main polluting element, according to the reference values, shows that superficial horizon exhibit values above the alert threshold.

Cadmium: considering the values of the total forms, it exhibits values predominantly falling between the normal level and the alert threshold. The characterisation of this element in terms of mobile forms, cadmium exhibits contents close to normal ones.

Copper: analysed by means of total forms, along surface horizons, it exhibits a content predominantly above the alert threshold. A characterisation shown by its mobile forms reveals that their content is either between normal and alert threshold values or between alert and intervention threshold values.

Zinc: analysed by means of its total forms shows that these values fall between normal and alert threshold values or between alert and intervention threshold values. Zinc mobile forms are close to normal values.

CONCLUSIONS

The analysis of the real values of heavy metal concentrations (Pb. Cd, Cu, Zn) in Zlatna soils reveals that after 10-12 years since the polluting factors have ceased to act, high values for sensitive areas and soils.

Lead can be considered, according to its total and mobile forms, the determining polluting element of the area.

The agrochemical monitoring of these soils devoid of any polluting actions is required, alongside the monitoring of other factors that prove to be determining for their fertility.

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